

## Sensors

# Passive Smart Container

RFID technology to quantify and track liquids and bulk goods

NASA's Johnson Space Center has developed a Passive Smart Container to monitor and track items that are too small to tag individually. Although Radio Frequency Identification (RFID) technology is being used widely for pallet and box level tracking in the commercial sector, significant technology gaps remain for tracking dense quantities at the item level. This system uses RFID circuits to identify the fill level in a container and could be easily converted for use in industries such as individual health care management, pharmaceutical manufacturing and distribution inventory tracking, and retail and supply chain inventory management. Use of this technology enables the manufacturer, distributor supplier or user to easily manage and control an inventory of small items that are difficult to tag such as bulk grain foods, liquids, pills, mechanical parts (nuts, bolts, and washers) and small electronic components.

## BENEFITS

- ➔ Improved inventory management and control: Identify, track and quantify small items
- ➔ Adaptable: Can be used to communicate with inventory management software
- ➔ Cost effective: Leverages common RFID integrated circuits for reuse
- ➔ Widely applicable: Used to track any type of item that is challenging to tag

technology solution

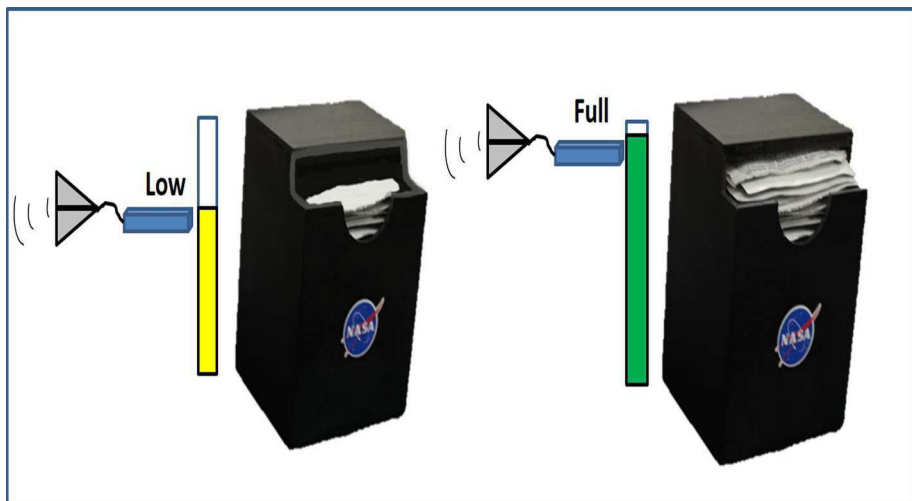
# NASA Technology Transfer Program

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## THE TECHNOLOGY

Passive Smart Container system comprises four major components: RFID circuits embedded in or around the container, an antenna and RF distribution system, and an interrogator/reader. The system uses passive RFID circuits placed on a bulk item container to track consumption and quantify items as the items are removed, added or replaced in the container. The antenna is strategically integrated with the lid or elsewhere in or around the container and is constantly coupling RFID signals to/from the RFID circuits. The circuits reply with information regarding the fill level in the container. A processor connected to the reader/interrogator can infer the fill level according to which RFID circuits respond and the magnitude and phase of the returned signals. The technology is compatible with the EPCglobal Class-1 Generation-2 RFID standard. This setup can be modified to track all kinds of items, large and small, making this technology suitable and applicable to an array of commercial fields.

RFID is a disruptive technology that has made a large impact on several industries, especially in supply chain and asset management. Passive Smart Container is well positioned to tap into this growing market. Its ability to account for discrete items as well as liquids and bulk goods that were deemed impossible or impractical to tag makes this technology relevant for an array of applications and industries.



This is one example of a passive smart container prototype showing the capacity level fill for small pill packets as seen through the graphical user interface that has registered the information from the RFID rings embedded in the back of the prototype and an internal spring-loaded traveler with an integrated antenna.

## APPLICATIONS

The technology has several potential applications:

- ➡ Pharmaceuticals: Applicable to items difficult to tag such as drugs and tablets
- ➡ Health care: Useful in monitoring medication and other health care-related items
- ➡ Consumable supply management: Track consumable items in a variety of industries

## PUBLICATIONS

Patent No: 8,933,789; 9031689; 9336421

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